Assessing Anesthetic Options for Nonsurgical Periodontal Therapy

Course Description:
To deliver optimal patient care, pain management is an essential component of periodontal therapy procedures. Supported by science, this course will provide the dental professional with the information necessary to make an anesthetic choice based on each patient’s needs.

Course Objectives:
Upon completion of the course the participant will be able to:
- Identify medical considerations for local anesthesia
- Review neurophysiology of drug interactions
- Discuss pharmacodynamics of local anesthetics
- Evaluate local anesthetic drugs to include; topical, injectable and non-injectable drugs
- Identify dental innervations techniques
- Identify local anesthetic complications
- Review signs and symptoms of anesthetic overdose
- Preview new anesthetic technologies

COURSE OUTLINE

1. Assessment Considerations
- Medical history challenges
- Pain management concerns
- Pregnancy
- Fear
- Multiple medications
- Undiagnosed and undisclosed medical conditions
- Cardiovascular problems

ASA Physical Status Classification
- ASA I
  - Normal, health patient
- ASA II
  - Mild, systemic disease
- ASA III
  - Severe systemic disease, not incapacitating – may need alterations to LA
- ASA IV
  - Severe systemic disease, constant threat to life – may experience adverse events to LA, modifications necessary
- ASA V
  - Moribund, imminent death – dental care is contraindicated

ASA Medical Component Patient Assessment Evaluation
- Pre-anesthetic evaluation of patient
• Prescription of the anesthetic plan
• Personal participation in technical aspects of regional anesthetic
• Remain physically available for treatment of emergencies
• Provide indicated post-anesthetic care

**Definition of Pain**

**Unpleasant sensation necessary for survival**
- Informs body of potentially dangerous changes
- Have a protective function
- Triggers reflex reaction to retract from painful stimulus
- If ignored could cause irreparable damage

**Classifications of Pain**
- Nociceptive pain - sensory receptors that detect injury
- Neuropathic pain - nerve injury or dysfunction of the sensory nerves
- Pain disorders associated with psychogenic factors

**Considerations of the Fearful Patient**
- Fear as a barrier
- Assessing and addressing strategies to manage fear
- Common psychogenic adverse events – hyperventilation, syncope

**Protocol for Stressful Patients**
- Premedicate prior to appointment
- Short morning appointments
- Minimize waiting time and monitor vital signs
- Administer adequate pain control
- Post-operative pain and anxiety control
- Follow up treatment

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### 2. Pregnancy Modifications and Considerations

**Pregnancy Guidelines for Perinatal Care Dental Anesthetic Drug Categories**

- Category B: No evidence of risk in humans; either animal studies show risk
- Category C: Human studies are lacking and animal studies are either positive for fetal risk or lacking as well
- Category D: Positive evidence of risk

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### 3. Multiple Medications and Potential Drug Interactions

- Medical and Dental History
- Patient’s medical status
- Medications (Rx and OTC)
- Dietary and Herbal Supplements
- Previous history with dental anesthetics
- Street Drugs – Methamphetamines, alcohol, marijuana
- PIL-Product/Patient Information Leaflet
4. Cardiovascular Concerns

Cardiovascular Concerns
- ADA & AHA Guidelines for prevention of Infective Endocarditis
- Cardiovascular Accidents (CVA): Absolute contraindication within first 6 months
- Transient Ischemic Attacks (TIA): Absolute contraindications within first 6 months
- Myocardial Infarct
- Hypertension

<table>
<thead>
<tr>
<th>Relative Contraindications</th>
<th>Absolute Contraindications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiovascular Disease</td>
<td>Myocardial Infarct</td>
</tr>
<tr>
<td>reduce levels of epinephrine</td>
<td>absolute contraindication ASA IV postpone LA for 6 months or consent of Dr.</td>
</tr>
<tr>
<td>Hypertension</td>
<td>Cardiovascular Accident (CVA)</td>
</tr>
<tr>
<td>&lt;160/100 no contraindications</td>
<td>absolute contraindication ASA IV postpone LA for 6 months or consent of Dr.</td>
</tr>
<tr>
<td>&gt;160/100 prompt medical referral</td>
<td>Transient Ischemic Attacks (TIA)</td>
</tr>
<tr>
<td>&gt;180/110 defer treatment</td>
<td>absolute contraindication ASA IV postpone LA for 6 months or consent of Dr.</td>
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</tbody>
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5. Metabolic Considerations

Metabolic Concerns
- Liver disease: Relative contraindication
- Kidney disease: Relative contraindication
- Uncontrolled diabetes: Relative contraindication
- Uncontrolled hyperthyroidism: Absolute contraindication
- Methemoglobinemia

<table>
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<tr>
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<tr>
<td>Liver disease</td>
<td>Uncontrolled hyperthyroidism</td>
</tr>
<tr>
<td>cirrhosis &amp; Hep B could interrupt the biotransformation of the amide metabolized in the liver</td>
<td>avoid vasoconstrictors, sensitivity to vasoconstrictors increasing their effect, medication controlled respond normally to vasoconstrictors</td>
</tr>
<tr>
<td>Kidney disease</td>
<td></td>
</tr>
<tr>
<td>anesthetics are metabolized in the liver and excreted thru the kidneys</td>
<td></td>
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<tr>
<td>Uncontrolled diabetes</td>
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<tr>
<td>limit the dose of vasoconstrictors, possible changes in blood levels of glucose</td>
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</table>
6. Undiagnosed and Undisclosed Medical Conditions

Undiagnosed and Undisclosed Medical Conditions
- Language barriers
- Hearing impaired
- Special needs
- Cultural barriers
- Informed consent

7. Pharmacodynamics of Local Anesthetics

Block nerve impulses
- Blocks sodium channels in nerve membrane at cellular level
- If sodium channel is blocked, impulse is not transmitted
- Different LA drugs differ in side effects, dosages, & duration of action

Electrophysiology of Pain Conduction
- Resting potential = -70mV (unstimulated nerve)
- Action potential - stimulus causes Na channel to open, allowing influx of Na+ ions into axoplasm
- Slow depolarization
  - Slow influx of Na+ inos thru channel causes electrical potential to become less negative
  - Threshold or Firing Potential = -60 to -50mV; Rapid depolarization begins
- Rapid depolarization
  - Rapid influx of Na+ thru channel so that electrical potential quickly reverses to +40mV; Action Potential is generated
- Repolarization occurs until resting potential is achieved (-60 to -90 mV)

Action of Local Anesthetics: Block the action potential
- Specific Receptor Theory
  - Amide-type anesthetics
  - LA molecule diffuses thru nerve membrane and attaches to receptor site within Na channel “blocking” the Na+ ions from passing thru

8. Evolution and Chemical Formulations of Local Anesthetic

- Ester-type:
  - Metabolized in blood
  - Highly allergenic; metabolite is PABA
  - Used only as topical
- Amide-type
  - Metabolized in liver & kidneys
  - Virtually non-allergenic
  - All injectables; some topical formulations

Specific Protein Receptor Theory
- Binds to receptor site in sodium channel
- Block entrance of sodium ions
- Act during depolarization phase
9. Local Anesthetic Terminology

1. PIL – Patient Information Leaflet
2. Concentration of Drug – what is expressed in a cartridge, 2%, 3% or 4%
3. Volume – 1.7ml which means (no less than) manufactures variation – FDA requirement
4. Percentage – expression of the relative amount of drug in a cartridge, 4% drug contains twice as much drug as a 2% drug
5. Relative contraindications – those in which local anesthetic may be given with caution
6. Absolute contraindications – situations which LA or vasoconstrictor drugs may not be administered safely
7. Absolute vasoconstrictor contraindications – NO EPINEPHRINE

10. Vasoconstrictors

**Definition:** A drug added to LA cartridges that constricts the blood vessels

**Benefits of Vasoconstrictors**
- Constrict blood vessels
- Decrease risk of toxicity
- Prolong duration
- Provide hemostasis via infiltration

**Types of Vasoconstrictors**
- Epinephrine – 1:50,000, 1:100,000, 1:200,000
- Levonordefrin – synthetic – 1:20,000
- Fight or flight reactions
- Allergy to Epi is impossible
- Mimics allergy symptoms

**Maximum Dosage Recommendations**
- Healthy patient – 0.2mg per appointment
- Epi-sensitive or Cardiac Dose – 0.04mg per appointment

**Sodium Bisulfite**
- Preservative added to reduce oxidation of epi
- Contraindications – sulfite allergy

11. Local Anesthetic Choices

**What type of anesthesia is needed?**
- Topical
- Infiltration
- Field Block
- Nerve Block

**Anesthetic Decision Tree**
- Topicals
- Compounded Anesthetics
- Non-injectables
- Injectables – Short, intermediate, long acting
12. Topical Anesthetics

Types of Topical Anesthetics
1. Benzocaine 20%
2. Lidocaine 5%
3. Benzocaine/Tetracaine products
4. Dyclonine Hydrochloride
5. Compounded Products

Indications for Use:
Topical anesthesia is a condition of temporary numbness caused by applying a substance directly to a surface of the body

Applications
- Gels, sprays, liquids, ointments, pre-measured dose, patch, OTC products

Compounding Pharmacy Drugs
- Anesthetics, mouth rinse, antibiotics, antifungals, cosmetic dental formulations
- Not FDA regulated
- Not tested for safety/efficacy
- FDA Modernization Act 1997 – The compounding product must be individually prescribed for an identified patient

Common Local Reactions
- Tissue sloughing
- Delayed hypersensitivity
- Redness
- Pain
- Burning at site

Comparing Drugs – Ask questions

13. Non-Injectable Anesthetic

Eutectic Mixture
- Two drugs combined
- Periodontal Gel – Eutectic Mixture of Lidocaine 2.5% + Prilocaine 2.5%
- Quicker uptake
- Longer duration
- Amide Classification
- Pregnancy B drug
- One approved FDA drug

Indication for Use
- Oraqix® is indicated for adults who require localized anesthesia in periodontal pockets during SRP

Oraqix Application
- Set appropriate expectations for patient
- Apply Oraqix to gingival margin of selected teeth
- Wait 30 seconds
- Insert blunt tip applicator subgingivally, walking thru pocket as Oraqix is dispensed, until the pocket is full
- Wait 30 seconds, Begin instrumentation
- Re-apply as necessary, up to maximum dosage of 5 cartridges per appointment

Oraqix Dosage
- Oraqix® can be used in combination with injectable anesthetic
• Can be safely used in any combination, so as not to exceed the MRD of 5 cartridges per appointment alone or combined with another drug

### 14. Injectable Anesthetics

#### Indications for Use

- Control and manage pain during dental procedures

#### Types

- Lidocaine-Xylocaine-Octocaine
- Articaine-Articadent-Septocaine, Zorcaine
- Mepivacaine-Polocaine-Carbocaine
- Prilocaine-Citaneest
- Bupivacaine-Marcaine

#### Infection

- Changes area to low PH in acidic range
- LA may not be effective

#### Questions to consider

- Duration of Procedure
- Extent of the treatment needed
- Generalized or Localized
- Need for Hemostasis

#### Injectable Choices

- **Short Acting:** Pulpal duration < 1 hour; Soft tissue < 2-3 hours
  - Mepivacaine 3%
    - Produces only slight vasodilatation; adequate duration without the addition of a vasoconstrictor
  - Prilocaine 4% by infiltration
    - Epi-free alternative with longer duration desired

- **Intermediate Acting:** Pulpal duration > 60 minutes; Soft tissue > 3 hours
  - Lidocaine 2% + Epi 1:100,000
    - Gold Standard ~ utilized for convenience
  - Lidocaine 2% + Epi 1:150,000
    - Indicated for hemostasis during periodontal surgery
  - Prilocaine 4% + Epi 1:200,000
    - Maximum pulpal duration with least amount of vasoconstrictor
  - Mepivacaine 2% + Levonordrenfrin 1:20,000
  - Articaine 4% + Epi 1:100,000 or 1:200,000
    - Metabolizes faster

- **Long Acting:** Pulpal duration > 90-180 minutes; Soft tissue > 4-9 hours
  - Bupivacaine HCL .5% + Epi 1:200,000

#### Children and Articaine

- Under 4 years of age not investigated
- Remember the solution %
- Simple procedures 0.04%
15. Dental Innervation

- Trigeminal Nerve, V1, V2 and V3
  - Ophthalmic Branch (V1) – Sensory
  - Maxillary Branch (V2) – Sensory
  - Mandibular Branch (V3) – Sensory and motor

**Injection Types**
- Supraperiosteal
  - Local infiltration
  - Field block, aka “infiltration
- Nerve Block

### Maxillary Injections

<table>
<thead>
<tr>
<th>Nerve</th>
<th>Tissues anesthetized</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSA Posterior Superior Alveolar</td>
<td>Pulpal/buccal soft tissues of molars, except MB 1st molar (30%)</td>
</tr>
<tr>
<td>MSA Middle Superior Alveolar</td>
<td>Pulpal/buccal soft tissues of premolars and MB root 1st molar</td>
</tr>
<tr>
<td>ASA Anterior Superior Alveolar</td>
<td>Pulpal/buccal soft tissues of cuspid and incisors</td>
</tr>
<tr>
<td>GP Greater Palatine</td>
<td>Posterior portion of hard palate to midline</td>
</tr>
<tr>
<td>NP Naso Palatine nerves bilaterally</td>
<td>Anterior one third of hard palate</td>
</tr>
<tr>
<td>IO Infraorbital, ASA and PSA</td>
<td>Pulpal tissue of max central through canine. In 72% of patients pulp</td>
</tr>
<tr>
<td>AMSA ASA and MSA</td>
<td>Pulpal tissue of max incisors, canines and premolars. Buccal Attached gingiva of same teeth, attached palatal tissues from Midline to free gingival margin on associated teeth</td>
</tr>
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### Mandibular Injections

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<tbody>
<tr>
<td>IA Inferior alveolar nerve and lingual nerve</td>
<td>Mandibular teeth to the midline, buccal mucosa, lip, anterior Two thirds of tongue, lingual gingiva, floor of the mouth</td>
</tr>
<tr>
<td>LB Buccal nerve</td>
<td>Soft tissues and periosteum buccal to the mandibular molars</td>
</tr>
<tr>
<td>M Mental</td>
<td>Buccal tissues anterior to mental foramen to midline, skin of lip and chin</td>
</tr>
<tr>
<td>I Mental and Incisive</td>
<td>Pulpal tissues of premolars, canines &amp; incisors; buccal Tissues anterior to mental foramen to midline, skin of lower lip And chin</td>
</tr>
</tbody>
</table>

### Failure of Anesthesia
- Anatomical variations
- Infection
- Individual reaction
- Intravascular/intramuscular injection
- Patient Anxiety
16. Local Anesthetic Complications

- Needle breakage
- Pain on injection
- Burning on injection
- Parathesia
- Trismus
- Hematoma
- Infection
- Edema
- Tissue sloughing

**Anesthetic Overdose = CNS toxicity**

Symptoms Include:
- Lightheadedness, dizziness, headache
- Visual disturbance
- Sedation
- Numbness or tingling of tongue
- Impaired concentration
- Dysarthria, Tinnitus, Metallic taste
- Muscular twitching

**Epinephrine Overdose**

Symptoms include:
- Tension
- Anxiety, apprehension
- Nervousness
- Tremors
- Increased heart rate
- Increased blood pressure
- Throbbing headache
- Hyperventilation

**Overdose Management**

- Terminate procedure
- Reassure patient
- Position patient comfortably
- Monitor vital signs
- Administer oxygen
- Medical assistance if needed

17. New Horizons

- Local Anesthetic reversal agent
- “Gate Control Theory”
- Nasal Mist
- Buffering Agents


27. Whitcomb M, Drum M, Reader A, Nusstein J, Beck M, A Prospective, Randomized, Double-Blind Study of the Anesthetic Efficacy of Sodium Bicarbonate Buffered 2% Lidocaine With 1 : 100,000 Epinephrine in Inferior Alveolar Nerve Blocks,


**Web Sites**

31. FDA Center for Food Safety and Applied Nutrition: www.cfsan.fda.gov
32. Herbal Interactions, Mayo Clinic: www.mayoclinic.com
33. info@st-renatus.com
34. NIH-National Center for Complementary and Alternative Medicine: http://nccam.NIH.gov
35. American Heart Association: www.americanheart.com